1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

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of shifting cultivation in the area. In such a case reforestation would be assured by keeping fire out of the old clearings. This could be done by leaving relatively non-inflammable forest belts at least 60 feet wide between individual clearings. These forest belts would offer some protection against the spread of grass fires and at the same time would be a source of seed for further reforestation. Reforestation under such circumstances would be much easier and cheaper than if large contiguous areas were to be cleared and used.

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Where natural reforestation is particularly slow, cultivators should be required to practice artificial reforestation. In scattered regions in Southeastern Asia tribesmen do this on their own initiative. Pendleton reports such a case in Burma.[35] Certain Dyak tribes in Borneo plant seeds of the candlenut tree (*Aleurites moluccana* Willd.) about 3 meters apart in a freshly cleared ladang before it has even been burned. In the eastern part of the Malay Archipelago shifting cultivators plant such trees as *Aleurites moluccana* Willd., *Erythrina lithosperma* Miq., *Albizzia falcata* Backer, *Hibiscus similis* Bl., *Casuarina equisetifolia* L., *Macaranga* species, *Euphorbia* species, *Sesbania grandiflora* Pers., and *Desmodium timoriense* DC. for the purpose of restoring the forest.

In Sumatra Deli tobacco planters initiated artificial reforestation after alang-alang had regularly invaded their fallow fields and caught fire so frequently that second-growth forest could not get a start. In Deli the tobacco fields are in use only 1 year and lie fallow 7 to 10 years. They should be protected by forest growth during that period. Therefore, in order to make this possible, the planters controlled fires by planting belts of teak along the highways and roads. These belts served as fireguards and at the same time provided lumber for tobacco-drying sheds. On the tobacco fields themselves they planted especially *Albizzia falcata* Backer, *Cassia siamea* Lam., *Pithecellobium saman* Benth., and *Leucaena glauca* Benth., which drive out the alang-alang[36] (Figs. 34–39).

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Another way of speeding up reforestation is to spare a few of the larger trees at the time of the clearing. This is done by the Malays of Sumatra. They do not cut down *Koompassia parvifolia* Prain, *Arenga saccharifera* Labill., *Durio zibethinus* Murr. (durian), *Parkia* species, or *Garcinia grandifolia* Pierre.[37] The last three are fruit trees that are numerous in the forest, whereas the second is a palm whose flower stalk is tapped for its sugary sap and the first is preferred by bees as a hiving tree, which gives it its name, "bee-tree." This tree is preserved because the people want the honey. Worthington reports that in Africa "some tribes appear to realize the necessity of maintaining tree growth on their clearings and merely top the trees and lop the branches, so that the trees are enabled to

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[35] Similar cases are known in the residency of Benkoelen in Sumatra, in central Celebes, and in Flores. See Hagreis: "Ladangbouw," 1930, p. 631.

[36] Joehems: "De begroeiing der tabakslanden," n.d., pp. 77–89.

[37] *Ibid.*, pp. 30–32.

[See p 40 ff, cat. 116 --Analyst]

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groups resemble those of salt-tolerant vegetation on European beaches of which spinifex is a sample. Behind this shore grows a distinctive strip of what may be called *beach woodland*, sometimes referred to as beach forest. On reefs, on muddy shores and estuaries, where there is diurnal flooding at high tide, the *mangrove* forest develops. When the shore is rocky, lowland forest may reach high tide mark. In this vegetation seeds and fruit are waterborne so that currents are an important means of dispersion.

Well-developed beach woodland forms as a ribbon rarely more than 200 ft. inland from the shore and contains tree types not usually seen elsewhere and often reaching 90 ft. in height. The typical tree, the casuarina (Equisetifolia, rhu, ru, tjemara) is rather like a conifer to look at and is related to Australian she-oaks. Sometimes the casuarina is in pure stands; at places the strip includes screw pines (Pandanus), the leathery-leaved Calophyllum, Inophyllum and Barringtonia. Coconut palms, which can take root after nuts have been dispersed by sea-currents, are now prominent in beach woodland areas as a planted crop, but they occur self-sown everywhere through the islands.

Mangrove forests are widely distributed on sedimenting shores throughout Southeast Asia. The fringe of mangroves is interrupted where rocks or cliffs come to the sea and when drainage control has diminished the silt from terrestrial sources. Where mangroves develop, silt is being deposited at a fast rate (sometimes to a thickness of 1½ in. annually); the mangrove thus both raises the surface level and progressively presses farther seaward. Whether mangroves grow only where silt is being deposited or whether they cause silt deposition by their root system, obstructing tidal currents and flood run-off, is still disputed. Possibly both processes operate together. The net effect is one of raising the land level and reclaiming land from the sea. In addition, the wood of mangroves is valued for firewood and charcoal; the bark is sold extensively for tanning. The mangrove trees are of some thirty species, all with structural adaptations enabling them to root in unstable muds and to tolerate daily inundation of their root system by saline tidal water. In addition to the tree, there are shrubs, herbaceous plants and ferns (particularly Acrostichum aureum). The trees are evergreen, sometimes 100 ft. tall, mostly with shining, leather-like leaves, small flowers, and unusual root systems. Some (as Rhizophora) have many roots supporting the trunk which begins well

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Tropical Rain Forest is remarkable for the number of tree-types which go to make it and for its heterogeneous composition. Continuous stands of any single tree species very rarely occur, and often thirty may be found in a forest patch 100 yds. square. While the trees differ widely, the family group Dipterocarpaceae, gigantic in dimensions and bearing winged seeds like shuttlecocks, is the most prominent. Within the forest individual trees are restricted by the congestion so that the shape of high trees in tropical gardens or along roads is no guide to their shape when in their natural setting.

From the thousands of tree types in this forest some commercially valuable timbers, gums, resins and camphor can be obtained. Most of the trees, however, are commercially useless; the heterogeneous composition and density of the forest operates against exploitation of even those species which could prove useful.

Within the Tropical Rain Forest, several subsidiary types may be recognised.

(*a*) Parts of Borneo, Sumatra and Malaya have a white, porous, sandy subsoil thought to be a tropical podsol (see Chapter 5). Upon this, pitcher plants, conifers and a treeless, heathlike ecology of grasses and shrubs may develop.

(*b*) Upon porous limestone landscapes, the trees are short and epiphytic plants are most common, since these can tolerate the absence of groundwater.

(*c*) Behind the mangroves and transitional between them and the true lowland Tropical Rain Forest, are Freshwater Swamp Forests, extensively developed in Sumatra, Malaya and Borneo. The plants peculiar to this swamp setting vary with the duration of freshwater flooding. Trees here are shorter, fewer in species, well-buttressed and often stilt-rooted. Over considerable areas stands of a single type of palm may occur and palms of short varieties cover the ground to impede movement. Sometimes on the east coast of Sumatra the Freshwater Swamp Forest produces a tropical bog on peat soil formed by rotting vegetal remains several yards deep.

Secondary Forest.—The sequence of vegetation which replaces Tropical Rain Forest after removal is called Secondary Forest, made up of ferns, tropical grasses and scrub. It may be subdivided into distinct vegetation types which are various stages in the transition from naked ground to tropical forest. The process of replace-